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SCIENTIFIC BOOKS

The Teaching of Physics. By C. RIBORG MANN. New York, Macmillan, 1912. Pp. xxv + 304. \$1.25.

Professor Mann's well-known views on the methods of teaching high-school physics find, in his book on this subject, well-developed and orderly expression, much more thoroughly worked out and carefully arranged than was possible in his numerous earlier papers and addresses. It is only natural that a decided improvement should be the result of such change in form of presentation, and yet it would be difficult to find another development, from fragmentary form into treatise, in which the material has gained so much in value as has the subject matter in review. The volume on "The Teaching of Physics" carries a constructive tone almost from the beginning.

The main lines followed are: The development of the high school itself, from an institution used mainly as a training school for college and university, to one at present so generally appropriated by the people who support it that only a small fraction of all its graduates later enter the university; the influence exercised by college and university upon the curriculum of the high school and upon the form of the separate courses therein; the effect of such influence upon the content and methods of the physics course. This effect seems to the author to be traceable in the change from the natural philosophy of the middle of the past century, with a decided leaning toward discussions of the concrete physical problems of the arts and of every-day life, to the more abstract and disciplinary methods of the later school science. The doctrine of formal discipline receives a share of the blame for the change so traced—a doctrine which has thrown its baneful influence even over the study of the classics of our literature. After citing authorities in the field of educational psychology to prove that the hope of transfer of discipline, gained in one field to another field of mental endeavor, is a mere will-o'-the-wisp, Professor Mann urges the teachers of high-school physics to bring the science home to their pupils, to a state of usefulness such that application may be made

naturally and immediately to the needs of every-day life—a thing necessary indeed if a vast majority of the pupils are to receive any appreciable benefit from the subject. He contends that such a change will be accomplished only when the content of the course concerns itself less with highly abstract ideas, less with highly developed systems of units, and more with broad general principles applicable to the real and concrete problems which the pupil, and later the man and the woman, meet in their work and recreation. A discussion of present-day text-books follows—mainly adverse criticism—and some proposed remedies are suggested in the form of new methods of approach to the more fundamental principles. To these criticisms and suggestions is added the further suggestion that only by a process of experimental development will there be evolved a satisfactory high-school course in physics; with equally satisfactory text-books. The need is for cooperative effort and study of the problem on the part of large numbers of physics teachers.

The details by means of which Professor Mann has followed these lines of development have been handled by him generally in excellent and convincing manner, though at times some of them have been thrown into prominence not altogether warranted by their importance. One easily appreciates the criticism of the somewhat dogmatic form in which statements of facts and theories are too frequently made by authors of text-books—such statements are surely enough benumbing to the pupil. The suggestion is good, also, that, so far as possible, the laboratory be used to settle points of uncertainty or of controversy raised in the class room, rather than merely to verify, by measurements, physical laws which are already known by the student far more accurately than his measurements can be made. The author shows, further, that it has been just this attitude, of desire to bridge a gap in knowledge, which has been effective in advancing the science in the past; a student trained to use the laboratory to settle problems, real to him, would be much more likely to find physics of value to him in later years—himself to be of more value to the science.

The use of concrete ideas is treated at some length in one of the chapters; the discussion is given in excellent manner. Careful distinction is made between concepts which are merely specific and such as are concrete. The use of concrete elements in leading up to the formulation of general laws and principles is fully discussed.

Many other points of interest and of real importance to the teacher are considered. For instance, the last chapter of the book is devoted to a valuable discussion of various methods of examination by which the efficiency of the work in the different features of the course may be tested.

There are, however, other points which are not so convincing. The author gives (Chapter V. and subsequent pages—cf. 109–112, 117, 123, 187) a somewhat elaborate development of the ideas that science is the result of demands made by industrial and commercial growth, and that the habits of “cooperative and democratic industry of the Germanic races” (as contrasted with the “innate, immutable ideas” of the “aristocratic Greeks”) have been all-powerful in building up our modern physics. Similarly the statement is made and frequently repeated (page 166) that “the man of commerce may think that the world’s accounts are settled by money; but the student of real physics . . . knows that energy is the final basis of industrial values.” We may agree with these statements, or we may not, as the case may be, but when the author uses them as partial justification for the contention that the energy principle should form the unifying basis of the course in physics to the exclusion of theories and hypotheses, his main arguments for such procedure, valid enough in themselves, lose something of their due force.

Again, in the chapter on the discipline of physics Professor Mann would be more convincing if the statements concerning the transfer of discipline were held within the limits set by the authorities quoted. On page 191 is the statement “since a scientific habit of mind, when developed in physics, is not transferable, while a conscious ideal is transferable

. . .”; as a matter of fact the chosen authorities would justify nothing more conclusive in statement than that such habit is “probably not” transferable. The most vigorous opponents, among educational psychologists, of the old dogma of formal discipline would probably hold the question as yet open; this much would be indicated by their recognition of some transfer of discipline, some of them explaining the residual on the theory of common elements, others on the theory of transfer of method.

Occasional references to the principle of relativity and to the principle of least action, induced apparently by the frequent use of Poincaré as authority, are likely to be misleading when found in a discussion of the teaching of high-school physics. These principles are very much in the air in these days, to be sure, but one is hardly justified therefore in stating (page 233) that “this idea of maximum efficiency is valuable as giving a first inkling of the meaning of the principle of least action.”

Even though one may feel inclined, on reading the volume, to differ from some statements and may not feel justified in following Professor Mann in constructing a high-school course according to the favorite plan of the author—excluding, as far as possible, consideration of theories and hypotheses—yet there remain reasons in plenty to justify the judgment that this is a notably helpful and searching treatment of a much-harrowed field. Differing or not, as the case may be, on specific suggestions and arguments, the reader finishes the book with admiration for its spirit of helpfulness. The book is more valuable, indeed, because it is ground for some wholesome difference of opinion.

For his basic contention that physics should be made *real* to the students and evidently applicable to their every-day life, and that the students should be trained in this application, Professor Mann should have the praise and support of every serious teacher. The high-school teacher should not be left long in doubt, by college and university officers, as to the acceptability of such physics for college entrance for the relatively few high-school pupils

who later find their way to college or university. No better groundwork could be found for college or technical school physics than the ability, on the part of the student, to apply the science to his every-day problems.

The volume is one of the series which appears under the title "The Teachers Professional Library," edited by Nicholas Murray Butler. The Macmillan Company is to be commended for the attractive and substantial form which the book has been given.

F. E. KESTER

Thick Lens Optics. An elementary treatise for the student and the amateur. By ARTHUR LATHAM BAKER, Ph.D., Manual Training High School, Brooklyn, N. Y. D. Van Nostrand Co. 1912. Pp. ix + 131. \$1.50 net.

University texts on optics, as a rule, treat first order lens theory but incompletely and the aberrations of the third and higher order scarcely at all. The average university instructor in physics regards geometrical optics as an alien subject properly disposed of in high school. Reference texts of lens theory, on the other hand, deal largely with the third order theory and fail to give an elementary comprehensive treatment of first order theory.

Baker's little lens primer well fills this gap between the university text and the special treatise and will be heartily welcomed by oculists and by manufacturers and users of spectacles and other low-power lenses. It is confined strictly to first order theory, giving a simple and able treatment of image formation and focal power of combinations of thin and thick lenses. Diagrams are plentiful and good. A great many numerical examples are given and one chapter is devoted to the experimental determination of the optical constants of lens combinations with simple apparatus. When the book is revised it would be well to adopt a less formal style and perhaps either add a chapter on the special problems of spectacle lenses or mould the whole into an introduction to advanced lens theory.

P. G. NUTTING

Prisms. Their Use and Equivalents. By JAMES THORINGTON, A.M., M.D., Ophthalmic Surgeon, Professor of Diseases of the Eye in the Philadelphia Polyclinic. P. Blakiston's Son & Co. 1913. Pp. 144.

This little book is based on its author's course of lectures on this subject delivered each winter at the Philadelphia Polyclinic. It deals with the use of prismatic spectacle glasses in correcting muscular defects of the eye. Methods of evaluating prisms combined with spherical and cylindrical lenses are described and a number of useful tables given. The diagnosis and measurement of imperfect muscular balance (*heterophoria*) and of deviation from parallelism (*heterotropia*) of the eyes are discussed at some length. The book is well written and well illustrated and bears evidence on every page of the author's grasp and first-hand knowledge of the subject.

P. G. NUTTING

SPECIAL ARTICLES

A PARASITE OF THE CHINCH BUG EGG

IN the experiments conducted this year to determine the time of the first appearance of young chinch bugs and the mortality of the eggs, a large number of eggs were collected in the field for examination. The eggs which were collected at different intervals and in different localities were examined daily. While thus examining the eggs it was noticed that some of them became dark in color instead of assuming the usual red coloring. These eggs were isolated and on May 19 there emerged from them three parasites. With these three parasites as a basis, the life history was carried through four generations, running up to July 5. Since this was the time between the two broods of the chinch bugs, it became impossible to obtain additional chinch bug eggs with which to continue the work. From July 5 to July 23 only an occasional parasitized egg was found in the field, but beginning with the latter date, parasitized eggs were found in large numbers in the corn fields and the second generation was obtained by August 10. Up to the present date